• COLORADO RIVER •

AQUEDUCT NEWS

THE METROPOLITAN WATER DISTRICT OF SOUTHERN CALIFORNIA

Vol. I DECEMBER 20, 1934 No. 23

Merry Christmas

Acting on the recommendation of the General Manager and Chief Engineer, the Board of Directors of the District on December 14, 1934, adopted a resolution commending the employees of the District for the loyalty and efficiency of their services, and granting a holiday with pay on December 24, 1934, to all daily and monthly employees whose names appear on the District's pay rolls for the period ending December 26, 1934.

The Board's resolution is as follows:

WHEREAS, during the year 1934 the services rendered by employees of The Metropolitan Water District of Southern California have been characterized by a high standard of loyalty and efficiency, these services being divided into the three general classifications of construction operations, field engineering, and office administration, and

WHEREAS, during the past year the District's construction forces in the Coachella Division repeatedly have exceeded construction records for speed, economy, and safety, and during the month of November these construction forces surpassed all progress records they had made to date, having driven 9,407 feet of tunnel from fifteen headings during that thirty-day period, or an average of 8.04 feet of tunnel per eight-hour shift for each shift working during the month, and

WHEREAS, the District's field engineering and operation forces, in a large measure, have assisted in making possible the remarkable progress of aqueduct construction by contracting and District forces through their diligent and expert attention to duty at all times, whether day or night, and

WHEREAS, the employees in the District office administrative organization have devoted themselves to work far beyond the routine requirements of their duties, and have given to the people of the District a splendid record of public service, and

WHEREAS, it is the plan of almost all of the aqueduct construction contractors to shut down work for several days over the Christmas holidays,

NOW, THEREFORE, BE IT RESOLVED that the employees in the District's construction forces, whose names appear on the pay rolls for the period ending December 26, 1934, be granted a holiday with pay on December 24, 1934, and that employees in the District's engineering and office administrative forces likewise be granted a holiday with pay on December 24, 1934.

F. E. WEYMOUTH,
General Manager and Chief Engineer.

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AQUEDUCT NEWS
THE METROPOLITAN WATER DISTRICT OF SOUTHERN CALIFORNIA
LOS ANGELES, CALIFORNIA

Published twice monthly in the interest of Field and Office Workers on the Colorado River Aqueduct, and for the information of all other citizens of the Metropolitan Water District.

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CONTRACTORS AND DIRECTORS MEET

A few nights ago in the ballroom of the Biltmore hotel in Los Angeles, a group of men met together in one of the most significant gatherings which has been held since work began on the Colorado River Aqueduct.

Present were directors and officials of the Metropolitan Water District, guests of the Southern California Chapter of the Associated General Contractors. Also present were representatives of the contracting firms which are working on the aqueduct project.

The theme of the meeting was the Colorado River Aqueduct. In keeping with the tradition of "summing up" at the close of the year, accomplishments to date were recapitulated and plans for the future discussed.

The significant thing, though, is that so long as the engineers of a construction project and the contractors on that project can get together and discuss over a dinner table their problems and accomplishments in a frank, friendly fashion no fear need be felt for the success of the job.

A GRAND OLD CUSTOM

It is an old, old custom—but still a good one—this business of extending the season's greetings; so the NEWS takes this opportunity to wish its readers a very Merry Christmas and a happy, prosperous New Year.

VOLUME NO. 1 IS CLOSED

The first volume of the AQUEDUCT NEWS comes to a close with this issue. In issue No. 1 of Vol. 1, we said the one purpose to which we would adhere would be "the performance of a genuine service to the men and women who are banded together in the building of the Colorado River Aqueduct." How well we have succeeded we cannot say, but of one thing we are certain—we shall go right on trying.

GENERAL MANAGER REVIEWS ACTIVITIES OF MONTH ON AQUEDUCT

(EDITOR'S NOTE: The following is a brief summary of some of the District activities as set forth in the monthly report of General Manager and Chief Engineer Weymouth, filed with the Board of Directors in December, covering work during November.)

Legal Division

On November 2, 1934, payment was made for Interim Certificate No. 18 in the principal amount of $1,500,000 covering bonds sold to the Public Works Administration, pursuant to the Loan and Grant Agreement heretofore made. The necessary documents to secure payment for Interim Certificate No. 16, in the principal amount of $2,016,000 covering bonds purchased by the Reconstruction Finance Corporation were prepared, and payment for said certificate was made.

Miscellaneous Activities Division

During the month of November the labor employment office issued Certificates of Registration (identification cards) to 647 employment applicants. Up to November 30 a total of 6,824 such certificates had been issued by the employment office.

Field Engineering and Construction

Engineering—District survey parties were engaged in referencing of points on the aqueduct line under new schedules of conduit and canal work.

Safety Engineering—During the first ten months of 1934 thirteen aqueduct camps worked one or more months each on tunnel driving operations (an aggregate of 23 months, 377,490 man hours) without any workman sustaining a lost-time accident.

Testing Laboratory—During the month of November 19,000 barrels of Riverside cement, 10,000 barrels of Colton cement, and 18,000 barrels of Victor cement were tested and accepted for shipment to the aqueduct.

Operation of Utilities—During November a total of 5,740,800 kw-hours of power was used; about 13,430 (long distance) telephone calls were handled; 2,018,421 cubic feet of water was delivered.

Parker Dam, Bureau of Reclamation—Six Companies, Inc., continued the construction of its permanent camp; the office building, one dormitory, and the mess hall were occupied during the month.

Aqueduct Construction—(See tunnel progress table on Page 6 for current progress figures.)

Civil Engineering Division

Specifications—Six sets of specifications were issued during November, and at the end of the month copy for specifications for construction of Big Morongo and San Andreas siphons was in the hands of the printer.

Design—Studies were made and designs prepared for reinforced concrete lining for Valverde and San Jacinto tunnels; observations of flow conditions in the transition section model at Sawtelle reservoir were begun.

Distribution—Final field location of the Monrovia and Pasadena tunnels was completed during the month.

Hydrography—In cooperation with Consulting Engineer A. L. Sonderegger data relating to flood conditions on the San Jacinto River at the aqueduct siphon crossing were compiled and analyzed.

Statistics—New estimates were completed as a basis for a construction budget and for a continuing budget to be brought up to date monthly. New forms and charts were prepared for the canal, conduit, and siphon work just starting.

Electrical Engineering Division

Designs for the concrete structures connecting the pump delivery lines to the main aqueduct at Gene, Iron Mountain, and Hayfield plants were completed, and work is progressing on the design of the remaining transition structures. A draft of specifications for the Boulder Dam telephone line was completed.

Personnel Division

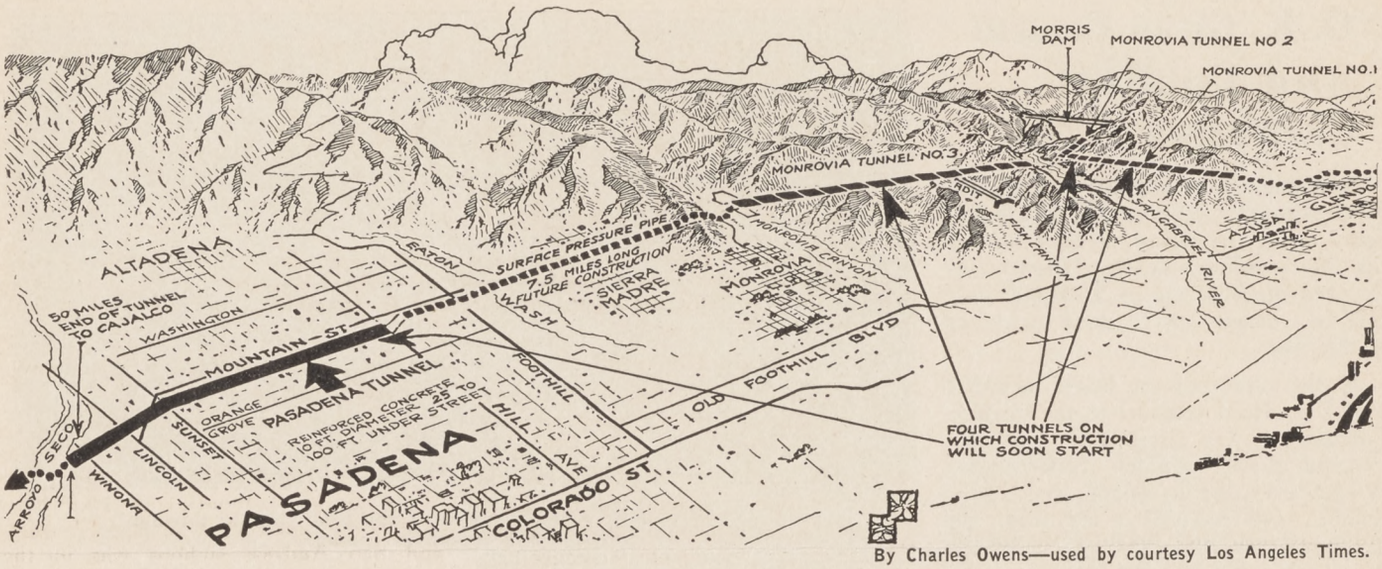
The net labor turnover for all divisions for October was 4.3 per cent, which is the lowest to date. Turnover for unclassified positions also reached a low point, being 5.84 per cent. For classified positions the net turnover was .49%.

Purchasing Division

Purchase orders issued during the month of November amounted to approximately $128,173.37, representing an issuance of a total of 887 orders.

Accounting and Costkeeping

Actual costs to November 30 amounted to $30,261,941.86, covering portions of works and activities, the total cost of which is estimated at $102,026,405.



By Charles Owens—used by courtesy Los Angeles Times.

BIDS RECEIVED ON DISTRIBUTION TUNNELS

The launching of construction of 10 miles of tunneling on the distribution system of the aqueduct moved another step closer this week as low bids totaling $2,812,080 were received for the work.

West Construction Company submitted a low figure of $502,700 for Monrovia Tunnels Nos. 1 and 2, and $1,688,200 for Monrovia No. 3.

L. E. Dixon, Bent Brothers, and Johnson were low on the Pasadena tunnel with a bid of $621,180.

Both Firms Experienced

Both of these firms are experienced in aqueduct work, West Construction Company holding the contract for the Whitewater tunnels on the main line, and the L. E. Dixon, Bent Brothers portion of the Dixon-Bent-Johnson group, having the contract for the west portion of the West Eagle bore.

Eleven bids were received on the four distribution tunnels, a complete roster being as follows: Utah Construction Company and Morrison-Knudsen; S. S. Magoffin Company; West Slope Construction Company; Dravo Contracting Company; Rohl-Connolly Company; L. E. Dixon, Bent Brothers, and Johnson; Shofner & Gordon and Hinman Brothers Construction Company; West Construction Company; Winston-Kaiser-Bechtel; Merrit, Chapman & Scott Corporation; and the J. F. Shea Company.

Monrovia No. 1 will extend from a point north of the city of Glendora a mile and a half northwesterly to a crossing of the San Gabriel River, about 2,000 feet downstream from Morris Dam, which impounds the water in Pine Canyon reservoir, one of the major terminal storage basins of the aqueduct system. Excavation of this bore will be carried forward from its west portal in San Gabriel Canyon.

940 Feet Long

Monrovia Tunnel No. 2, only 940 feet in length, is a part of the connecting line to the reservoir. It will be driven from the same portal as No. 1, forming one arm of a Y.

From the river crossing, Monrovia Tunnel No. 3 will extend in a westerly direction for six miles to a portal in Monrovia canyon. About four miles from its west portal, a 1,600-foot adit, or horizontal access tunnel, will be driven into the main tunnel line. The adit portal will be located in Fish canyon. From the junction of the adit and the main tunnel, crews will excavate in two directions. At the same time, other crews will attack the tunnel from its west portal in Monrovia canyon.

To Arroyo Seco

Pasadena Tunnel, 2.3 miles long, will pass under a densely populated section of Pasadena. It will extend under Mountain street, from Hill avenue to Sunset avenue, and then under privately owned lands and cross streets to a portal in the Arroyo Seco. Its depth beneath the surface will vary from 50 to 100 feet. This bore will be driven from the Arroyo Seco portal. Spoil from the tunnel will be used for certain city of Pasadena road work in the vicinity, and for an extension to the Pasadena Municipal Golf Course.

All of the tunnels will be circular and 10 feet in diameter. Water will flow through them under pressure. The Pasadena tunnel will be lined with concrete reinforced throughout to withstand internal pressure. The concrete lining of the Monrovia bores will be reinforced where necessary.

Specifications covering the work revealed that the following construction quantities are involved in this new aqueduct tunnel undertaking: 272,000 cubic yards of tunnel excavation, approximately 5,000 cubic yards of approach cut excavation, 110,000 cubic yards of concrete, 12,000,000 pounds of steel, 1,550,000 board feet of timber, and 176,000 barrels of cement.

Pressure Pipe

The four tunnels will be linked together with sections of pressure pipe approximately 10 feet in diameter.

The new bores form an important part of the 144-mile distribution system which will pick up Colorado River water from the terminal reservoir at the end of the main aqueduct, and carry it to the thirteen Southern California municipalities in the Coastal Basin which make up the Metropolitan Water District.

This system, the detailed plans for much of which still are tentative, will spread out fan-wise from Cajalco reservoir, terminus of the main aqueduct line, located about 12 miles south of the city of Riverside, and just west of Valverde tunnel on the main aqueduct.

The four new tunnels, as well as the entire distribution system, will be carried forward under the supervision of R. B. Diemer, distribution engineer of the District. The launching of work will culminate many months of intensive surveys and office engineering by the distribution staff.

O. K. Given Cement And Conduit Contracts

New impetus was given to Colorado River Aqueduct construction on December 7 when the Board of Directors of the Metropolitan Water District authorized the purchase of 5,000,000 barrels of cement for a total price of $7,000,000.

At the same time the Board awarded a $1,739,846.24 contract to the Griffith Company of Los Angeles for the construction of approximately thirteen miles of aqueduct conduit, siphon, and outlet channel, and accepted a bid from the Reconstruction Finance Corporation for the purchase of $12,096,000 worth of Colorado River Aqueduct bonds.

The huge award—said to be the largest single cement order ever placed—was made to the California Portland Cement Company, the Monolith Portland Cement Company, the Riverside Cement Company, and the Southwestern Portland Cement Company. The contract provides that the quantity to be purchased may be varied twenty per cent more or less.

The Board's action was taken on the recommendation of General Manager F. E. Weymouth who pointed out that the $1.40 per barrel price offered by these companies is nine cents per barrel lower than the price being paid by the United States Government for cement used in the building of Boulder Dam.

The Griffith contract awarded for conduit, siphon, and outlet channel construction covers all such works which are to be built on the aqueduct line between the west portal of San Jacinto tunnel and the Cajalco reservoir, western terminus of the main aqueduct, except the Shea award of Schedule 20. Included are five and one-half miles of siphon, six and one-quarter miles of conduit, and approximately one mile of outlet channel.

General Manager Weymouth's recommendation that the contract be awarded to the Griffith Company, called attention to the fact that the $1,739,-846.24 bid is $352,472.46 lower than the best price offered for the same work in a previous bidding on October 31. The October 31 bids were rejected because of high price and irregularities in some of the tenders submitted. Part of this difference results from changes in the methods of construction specified and part from lower bidding, Mr. Weymouth declared.

J. F. Shea Company's camp, scene of the first "holing through" of a major aqueduct tunnel.

Bids To Be Taken On Two More Siphons

Sealed proposals for constructing the Big Morongo and San Andreas siphons of the aqueduct will be opened at District headquarters on January 7, according to an advertisement issued December 5.

The work includes 1.86 miles of aqueduct construction.

Big Morongo siphon will be located near the west portal of Morongo Tunnel No. 2, most westerly of the bores on the Coachella division of the aqueduct. The San Andreas structure will be built a short distance east of Whitewater Tunnel No. 2.

The District's advertisement invites bids for constructing the siphons of either 12-foot four-inch jointed concrete pipe cast in place, 12-foot precast concrete pipe, or 12-foot eight-inch welded steel pipe supported on concrete piers.

District specifications provide that proposals on schedules involving precast concrete pipe will be considered only from bidders presenting satisfactory evidence that if awarded the contract the pipe will be furnished and installed by an organization, experienced and qualified in the manufacture and installation of precast reinforced concrete pressure pipe of the class specified.

The Big Morongo and San Andreas siphons were included in the work on which bids were received October 31. Bids on them were rejected to make possible obtaining bids on an alternative type of articulated poured in place construction not previously provided.

Cottonwood Tunnel Holed Through Dec. 12

Scoring a direct "bull's-eye," crews of the J. F. Shea Company have holed through the Cottonwood tunnel of the Colorado River Aqueduct, first major bore of the project to be completely excavated.

Working in opposite directions on the three and eight-tenths mile tunnel, miners blasted through the last rock barrier separating them at 6:25 o'clock Wednesday evening, December 12, exactly seventeen months to the day after the launching of work on the bore. The tunnel is located approximately 150 miles east of Los Angeles, northeast of Mecca.

Throughout the course of the job tunnel driving operations were carried forward from two portals—east and west. A total of 610 feet of excavation per month was averaged on a six-day week.

This record, declared by construction men to be remarkable, was made under the direction of Gilbert Shea, general superintendent on the job, and one of the youngest construction superintendents on the aqueduct line.

Although four shorter aqueduct tunnel sections beat Cottonwood to the "holing through" stage, it is pointed out that the latter bore is the first of the major tunnels of the project on which excavation has been finished.

According to plans announced by the contractor, the setting up of concrete mixing and placing equipment is being launched immediately. Work will be started late in January or early in February on the placing of concrete lining in the bore.

DIRECTORY

BOARD OF DIRECTORS

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Franklin Thomas, Vice-Chairman
S. H. Finley, Secretary

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Beverly Hills.....George R. Barker
Burbank.....J. L. Norwood
Compton.....William H. Foster
Fullerton.....Walter Humphreys
Glendale.....Bernard Brennan
Long Beach.....William M. Cook
Los Angeles.....I. Eisner
Los Angeles.....Perry H. Greer
Los Angeles.....Walter A. Ham
Los Angeles.....D. W. Pontius
Los Angeles.....John R. Richards
Los Angeles.....Victor H. Rossetti
Los Angeles.....W. P. Whitsett
Pasadena.....Franklin Thomas
San Marino.....J. H. Ramboz
Santa Ana.....S. H. Finley
Santa Monica.....
Torrance.....Charles T. Rippy

Charles H. Toll, Treasurer
D. W. Pontius, Controller

GENERAL STAFF

General Manager and Chief Engineer.....F. E. Weymouth
Asst. General Manager.....J. L. Burkholder
Asst. Chief Engineer.....Julian Hinds
General Counsel.....James H. Howard
Asst. Controller.....J. M. Luney
General Superintendent.....James Munn
Chief Elec. Engineer.....J. M. Gaylord
Asst. to Gen. Mgr.....Don J. Kinsey

DIVISION ENGINEERS

Division 1.....R. C. Booth
Division 2.....W. E. Whittier
Division 3.....John Stearns
Division 4.....B. C. Leadbetter
Divisions 5 and 6.....J. B. Bond

SUPERINTENDENTS

Colorado River, Copper Basin and Whipple Mt. Tunnels, Walsh Construction Co., F. T. Huntington, Gen. Supt.; W. A. Huntington and E. A. Hatch, Tunnel Supts.

Coxcomb Tunnel and Iron Mt. shaft, Winston Bros., E. A. Bernard, Gen Supt.; F. T. Hillman and R. B. Johnson, Tunnel Supts.

Iron Mt. Tunnel, West Portal, Utah Constr. Co., Ben Arp, Gen. Supt.

East Eagle Mt. Tunnel and West Eagle Mt. Tunnel, east portion, Broderick & Gordon. C. J. Kavanagh, Gen. Supt.

West Eagle Mt. Tunnel, west portion, L. E. Dixon and Bent Bros. P. C. Guinn, Gen. Supt.

Hayfield Tunnel No. 1, Hunkin & Conkey Constr. Co., G. B. Hoag, Gen. Supt.; F. Backlund, Tunnel Supt.

Hayfield Tunnel No. 2, Shofner & Gordon, H. E. Warden, Gen. Supt.

Cottonwood Tunnel, J. F. Shea Co., Inc., Gilbert Shea, Gen. Mgr.; Joe Bonner and Carl Nelson, Tunnel Supts.

Mecca Pass Tunnels, Morrison-Knudsen, George Fortier, Gen. Supt.

Coachella Division, R. M. Merriman, Division Supt.

Yellow Canyon Adit, E. Coachella Tunnel—
District Force Account.....W. L. Taylor

Fargo Adit, East Coachella Tunnel—
District Force Account.....J. H. Manwaring

Berdoo Adit, East Coachella Tunnel—
District Force Account.....F. A. Weller

Pushawalla Adit, East Coachella Tunnel—
District Forct Account, Kenneth MacIsaac

Thousand Palms—
District Force Account.....D. L. Reaburn

Wide Canyon—
District Force Account.....John Jackman

Long Canyon—
District Force Account.....E. E. McCabe

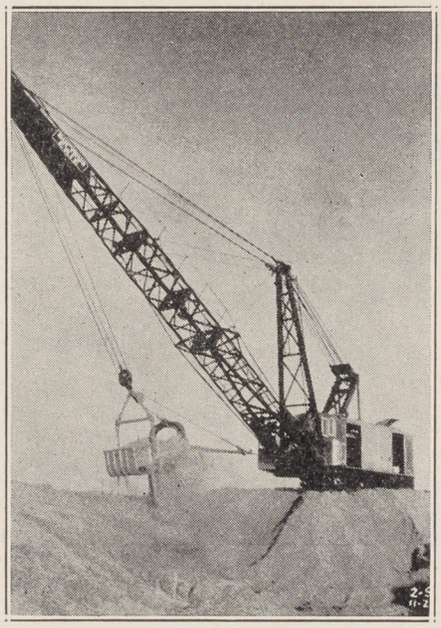
Little Morongo—
District Force Account.....R. L. Bryant

Whitewater Tunnels, West Constr. Co., H. E. Carleton, Gen. Supt.; Angus MacDonnell, Tunnel Supt.

San Jacinto Tunnel, Wenzel & Henoch, Walter Hoenecke, Gen. Supt.; W. A. Boyd, Walter Baer, and Jack May, Tunnel Supts.

Bernasconi Tunnel, Hamilton & Gleason Co., H. J. King, Gen. Supt.

Valverde Tunnel, Dravo Contr. Co., R. W. Remp, Gen. Supt.; H. C. Richardson, Asst. Gen. Supt.; Dean Luther, J. R. Glaeser, Jack Stone, and Fred Youmans, Tunnel Supts.



Another contractor moves out—a Barrett & Hilp-Macco shovel on the job.

Conduit, Canal and Siphon Work Is Under Way

Work on aqueduct conduit, canal, and siphon construction gathered momentum last week as contractors all along the line took steps to get under way on their sections of the line.

On both sections the Barrett-Hilp-Macco contract excavation has been started, and camp construction is underway. Wood & Bevanda also are excavating near Iron Mountain.

A four-inch air line has been laid from the compressor plant at the Utah Construction Company's West Iron Mountain Camp to Schedule 9, a canal section, and rock excavation has been launched by Utah crews at that point.

Three Companies, Inc., is completing the assembling of a Monigan Dragline for work on Schedule 12.

The erection of camp buildings was sublet by the Thompson-Starrett Company to Pacific System Homes, Inc., and work on them was started on December 4.

The contract of Jahn & Bressi for Schedules 5 and 5A—lined canal and siphon — was executed on December 15. On the same day the contract of the Griffith Company for Schedules 20A, 20B, 20C, 21, 22, 23, and 23A—siphon, conduit, and outlet channel—was executed.

Safety On the Aqueduct

Superintendents E. E. McCabe and R. L. Bryant, of Long Canyon and Little Morongo camps, received last week certificates from the United States Bureau of Mines, indicating a personnel 100 per cent trained in first-aid to the injured.

* * *

It appears that Little Morongo Camp is really in earnest about this "safety business." At a recent meeting at which 54 men were present, Little Morongo Camp Safety Club was organized. Charley Thomas was appointed temporary chairman and was elected president of the Club.

It was decided that each shift and shop department should elect one member from its group to serve on the General Camp Safety Committee. It is his duty to report any unsafe practises or violations of safety rules observed by or reported to him by anyone.

Little Morongo is organizing a Safety Team at the present time and expects to be 100 per cent "safety minded" in the near future.

* * *

Nearly one year ago the first of the Safety Clubs on the Coachella Division was organized at Camp Fargo by Superintendent J. H. Manwaring. Since its organization the Club has been actively engaged in promoting safety as well as providing entertainment for the men in the camp.

Meetings are held each Tuesday evening following the regular fortnightly shut-downs and are well attended by those not on shift. Safety suggestions from everyone in the organization are solicited and are subjected to open discussion at the meetings. If a suggestion is of practical value it is put into effect by the superintendent. The Club has been a prime factor in reducing the accident frequency at Camp Fargo during the past year from 289 to 133.

In celebration of the breaking of the camp record for tunnel driven during one day and for the best monthly total recorded so far the Club was treated after its last meeting, November 28th, to a Dutch lunch by Supt. J. H. Manwaring. A number of two-round boxing bouts, vocal solos and music by the Fargo Safety Club Orchestra completed the evening's entertainment.

BEST PROGRESS
This Period
6 day week: Seven Palms, West, 859 ft.
7 day week: Copper Basin, No. 2, 1111 ft.

TUNNEL PROGRESS

Nov. 16 to Dec. 15, 1934
Tunnel Excavated to Date, 54.34 Miles

BEST WEEK'S PROGRESS
This Year
6 day week: 7 Palms, West, 241 ft.
7 day week: Copper Basin, No. 2, 284 ft.

TUNNELS ON CONTRACT	Length in feet	Number of Shifts	EXCAVATION PROGRESS IN FEET: Average Per Shift	This Period	Total to date
Walsh Constr. Co.					
COLORADO RIVER	(5514)				
West Portal	5514	90	10.3	925	5322
COPPER BASIN, No. 1	(752)				
West Portal	752			0	752
COPPER BASIN, No. 2	(11,580)				
East from adit	1878			0	1878
Adit	330			0	330
West from adit	9702	90	12.3	1111	9320
WHIPPLE MT.	(32,265)				
East from adit	18,352	90	9.7	871	8189
Adit	924			0	924
West from adit	13,913	90	7.1	638	6692
Winston Bros.					
IRON MT.	(39,759)				
East from shaft	9844	84	5.4	456	3905
Shaft	165			0	165
West from shaft	13,743	84	9.0	755	7701
Utah Constr. Co.					
IRON MT.					
West Portal	16,172	90	7.9	708	10,642
Winston Bros.					
COXCOMB	(17,795)				
East Portal	8765	84	9.0	754	9036
West Portal	9030			0	0
Broderick & Gordon					
EAST EAGLE MT.	(9,442)				
West Portal	9442	84	5.9	496	2460
WEST EAGLE MT.	(26,494)				
East from adit	7871	84	7.8	659	4515
Adit	2008			0	2008
West from adit	7974	84	7.7	649	4059
Dixon & Bent					
WEST EAGLE MT.					
West Portal	10,649	84	6.5	544	7786
Hunkin & Conkey					
HAYFIELD, No. 1	(9677)				
East from adit	5317	78	6.5	510	4116
Adit	511			0	511
West from adit	4360	78	5.6	436	3803
Shofner & Gordon					
HAYFIELD, No. 2	(5435)				
West Portal	5435	52	8.9	463	4665

TUNNELS ON CONTRACT	Length in feet	Number of Shifts	EXCAVATION PROGRESS IN FEET: Average Per Shift	This Period	Total to date
J. F. Shea Co.					
COTTONWOOD	(20,105)				
East Portal	10,114	75	10.1	759	10,118
West Portal	9991	75	11.4	855	9987
Morrison-Knudsen			Concrete Progress to Date		
MECCA PASS	(5,940)				
No. 1, West Portal	338				338
No. 2, West Portal	997		Arch—5,940 ft.		997
No. 3, East Portal	4605		Invert—5,092 ft.		4605
West Constr. Co.					
WHITEWATER	(10,232)				
No. 1, West Portal	2060	78	8.2	638	1518
No. 2, East Portal	8172		Arch Concrete 2824 ft.		8172
Wenzel & Henoch					
SAN JACINTO	(67,415)				
East from Cabazon	8553	86	0.2	21	1705
Cabazon shaft	246			0	246
Cross drift	935			0	935
West from Cabazon	22,839	77	2.0	155	4874
East from Potrero	20,589	0	0	0	160
Potrero shaft	796			0	796
West from Potrero	6712	0	0	0	434
West Portal	8722	74	4.0	293	3997
Hamilton & Gleason					
BERNASCONI	(6220)				
East Portal	6220	55	5.9	323	5735
Dravo Contr. Co.					
VALVERDE	(38,765)				
East from Shaft 1	2140	0	0	0	2140
Shaft 1	64			0	64
West from Shaft 1	1525			0	2265
East from Shaft 2	5400			0	4660
Shaft 2	204			0	204
West from Shaft 2	5400	81	3.7	303	6130
East from Shaft 3	6950	76	5.1	388	3245
Shaft 3	192			0	192
West from Shaft 3	6950	76	3.6	275	5453
East from Adit	5117	79	1.4	107	269
Adit	391			0	391
West from Adit	5283	79	1.4	111	268
Total Excav. Contract Tunnels exclusive of Adits and Shafts (In Miles)	307,390 58.22	2157	6.6	14,203 2.69	171,911 32.56

TUNNELS ON FORCE ACCOUNT

	Sched.					
EAST COACHELLA TUNNEL		(96,605)				
Yellow Canyon Adit		686			0	686
East from adit	1	10,204	78	8.9	698	9197
West from adit	1	10,076	78	9.5	741	9617
Fargo Canyon Adit		891			0	891
East from adit	2	11,850	78	8.6	670	8334
West from adit	2	15,200	78	8.8	686	6830
Berdoo Canyon Adit		2042			0	2042
East from adit	3	15,824	78	7.2	560	9274
West from adit	3	12,456	78	9.6	746	9662
Pushawalla Canyon Adit		2935			0	2935
East from adit	4	10,186	78	9.8	764	7366
West from adit	4	10,809	78	8.3	647	7374
WEST COACHELLA TUNNELS		(81,454)				
THOUSAND PALMS						
No. 1, West Portal	5	16,058	78	7.1	555	8108
No. 2, Tunnel	5	3838			0	3838
WIDE CANYON	Sched.					
No. 1, E. Portal	5	5122	78	5.5	428	3736
No. 1, W. Portal	6	9183	78	7.5	585	7548
No. 2 Tunnel		848			0	848
SEVEN PALMS		(16,730)				
E. Portal	6	8390			0	4810
W. Portal	7	8340	78	11.0	859	5209
LONG CANYON		(15,295)				
E. Portal	7	8360	78	8.9	696	4950
W. Portal	8	6935				0
BLIND CANYON		(6848)				
E. Portal	8	—				0
W. Portal	8	6848	78	7.0	547	4281
MORONGO No. 1		(5712)				
E. Portal	8	5712	78	8.6	670	4010
W. Portal	8	—				0
MORONGO No. 2		(1820)				
E. Portal	8	1820				0
W. Portal	8	—				0
Total excav. Force Acct. Tunnels excl. of Adits and Shafts (In Miles)		178,059 33.72	1170	8.4	9,852 1.87	114,992 21.78
Total Tunnel Excavation (Miles)		91.94		7.2 ft.	4.56	54.34

Heading excavation is counted as two-thirds of full tunnel excavation. Adits and Shafts progress is not included in total footage.